THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

Publishing Office, No. 42 Pine Street.

Devoted to the Interests of Illumination, Heating, Ventilation and Sanitary Improvement, Domestic Economy, and General Science.

VOLUME XIV.—No. 7.
WHOLE No. 240.

NEW YORK, MONDAY, APRIL 3, 1871.

$3 PER ANNUM
IN ADVANCE.

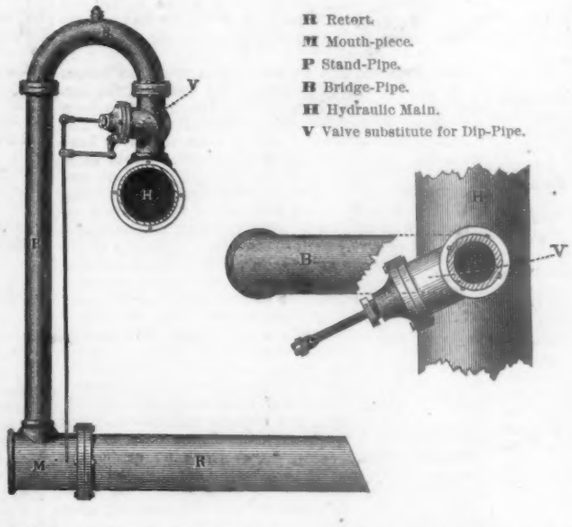
Gibson's Improvement in the Manufacture of Coal Gas.

The Gibson Valve Improvement in the manufacture of coal gas has of late attracted much attention from our gas engineers, and many devices have appeared to aid in carrying out the Gibson process, all of which in the opinion of Hon. Charles T. Stanbury, of Washington, are subject to the generality of Mr. Gibson's claim. The Chapman Valve seems to be the most in favor, being simple, economical and durable; by its use the improvement has obtained an increase of production of more than ten per cent. in quantity, and nearly five per cent. in illuminating power, using equal quantities of Westmoreland and Caledonia coal.

We extract from a pamphlet lately issued, a valuable digest of the comparative results that are to be obtained from the use of valves instead of dip-pipes, as follows:

"In order to determine the advantage possessed by the invention known as the Gibson Improvement, represented in the drawing, and the objections, if there were any, to its being brought into general use, before the attention of gas-light companies was particularly called to it, it was applied by the inventor to works under his charge for more than a year.

"During this time, its workings were observed by others, who became satisfied of its value and importance, and, in connection with the inventor, formed a company for the purpose of making such further investigations as might be deemed advisable, and taking such measures as might be necessary to bring it to the notice of gas-light companies in the United States.



"The claim of Mr. William Gibson, secured to him by Letters Patent of the United States, No. 95,459, dated October 5, 1869, is as follows:

'A gas apparatus, in which dip-pipes are dispensed with, and the retorts operated without pressure, by the introduction of one or more valves or cut-offs at any convenient point between the gas-producing material in the retort and the liquid contents of the hydraulic main, substantially in the manner, and for the purposes set forth.'

"In other words, the claim is for a cut-off between the retort and the hydraulic main, to take the place of the dip-pipe.

"The manner set forth is the introduction of a sliding valve between the bridge-pipe and the hydraulic main, thereby dispensing with the dip-pipe; for the purpose of taking off the pressure from the retort, caused by the dip-pipe, and thereby increasing the percentage of gas of a given quality from a given quantity of coal, by preventing or retarding the accumulation of fixed carbon in the retort.

"The invention was designed for, and is applicable to the apparatus in common use for the manufacture of illuminating gas.

"In the so-called reciprocating retorts of Mr. Lowe (described in Clegg, first edition, p. 81), both slide-valves and cup-valves were used, for the purpose of obliging the gases and vapors generated to pass alternately from one retort through another retort or retorts, before reaching the hydraulic main, in order more effectually to obtain in a gaseous form the products resulting from the destructive distillation of bituminous coal, but not for the purpose of dispensing with dip-pipes, or reducing the pressure within the retorts.

"In connection with brick retorts, or ovens, devised by Mr. Spinney (described in Clegg, first edit., p. 93), the upper end of the stand-pipe was furnished with an hydraulic valve, for the purpose of reducing the pressure upon the brick work forming the retort or oven, and avoiding the leakage to which a structure of this kind would otherwise be liable.

"Neither of these plans, described more than thirty years ago, proved practicable, or were ever brought into general use.

"The *slide and cup-valves* of Mr. Lowe were not made *substitutes for dip-pipes*, as in Mr. Gibson's claim; and the use of an *hydraulic-valve* by Mr. Spinney, to remove the pressure occasioned by the dip-pipe for the accomplishment of a specific purpose, does not conflict with Mr. Gibson's claim for the application of a *slide-valve* for the accomplishment of another purpose, though the particular and distinct ends sought by each were accomplished through the same channel, i. e., doing away with the pressure caused by the dip-pipe.

"Mr. Spinney's claim covers a brick oven (capable of receiving charges of five hundred weight, more or less, of coal), connected with a stand-pipe provided with an hydraulic valve, for the purpose of reducing the leakage.

"Mr. Gibson's claim covers any kind of valve or cut-off, but more particularly a slide-valve between the retort and the hydraulic main, without specifying any particular kind of retort; and it is for the purpose of preventing the accumulation of fixed carbon within the retort, in order to increase its durability, and to increase the quantity of gas of a given quality, produced from a given quantity of coal.

"A patent has recently been granted for a method of reducing the pressure upon the retorts, by drawing off the liquid contents of the hydraulic main, after the retorts have been charged, and replacing the liquid (so as to seal the dips), at the time of drawing and recharging them.

"The same end is accomplished by means of cup-valves within the hydraulic main, connected with the dip-pipes, which are raised and lowered, for the purpose of sealing and unsealing these pipes.

"By neither of these devices are dip-pipes dispensed with; and none of them accomplish what the Gibson plan accomplishes, the latter being the only method yet devised by which the exhauster may with safety be operated so as to *entirely* remove the pressure within the retorts.

"In many gas works, as they are now arranged, *less than four-fifths* of the coal now used may be made to produce as much gas, of as good quality, by simply dispensing with dip-pipes; and there is no way by which this can be done so safely and effectually as by the Gibson Improvement; and by no other method yet devised for accomplishing this object can the most economic results be obtained from the destructive distillation of coal for the manufacture of illuminating gas.

"In many works, and with many kinds of coal (such as are commonly used), by adopting this improvement, a saving may at once be effected of one-fourth of the cost of the coal required to maintain them, less the value of the residuary products—coke, coal-tar, and ammoniacal liquor—of the coal carbonized.

"The results which have been obtained by means of this mode of dispensing with dip-pipes, not only in works where the exhauster is used, but in those not provided with exhausters, leads to the conclusion, that

the obstruction occasioned by the dip-pipes has been generally underrated by gas engineers.

"It is certain, that when the tar has been depressed to the bottom of the dip-pipe, a full gas way is not open; and the probability that there is an impact of the gas within the retort, caused by the obstruction met with in the dip-pipe, is, to say the least, worthy of consideration.

"The losses sustained in gas-works, which are solely attributable to the obstruction caused by the dip-pipes, may be briefly stated as follows:

"1. From decomposition within the retorts of those products to which alone the gas generated owes its illuminating power.

"2. From the accumulation of carbon in the retorts reducing their capacity, thereby rendering it necessary to reduce the charges of coal, and consequently reducing the quantity of gas they are capable of producing in a given time.

"3. From the same cause (the deposit of carbon), more fuel is required—carbon being a slow conductor of heat—rendering it necessary to force the fires in order to "*work off*" the charges of coal.

"4. Consequently, a more rapid destruction of retorts, fire-places, and flues.

"5. From time and fuel expended in burning out retorts to remove the carbon, during which process they are unproductive.

"6. From leakage of gas through the pores of the retorts, particularly while they are new.

"The application of the plan is simple, requiring only slight alteration of the ordinary connections of the bridge-pipes with the hydraulic main.

"The parts applied are durable, not liable to derangement; and, when in use, are easily managed, requiring less skill and labor for this purpose than is needed for the removal and replacement of the lids of the retorts.

"A short time only is necessary to remove the dip-pipes from a bench of retorts, and substitute the Gibson Improvement for them, the parts being previously got in readiness; and this may be done at any time when it is convenient to omit a charge of all the retorts connected with the same main.

"No special kind of valve is necessary. It is only required that it should be tight, and not liable to adherence or derangement. That which has been adopted is of recent invention, and well fitted for the purpose. It is known as the Chapman Valve; and its peculiarity lies in a hollow conical plug, which takes its bearing upon Babbitt metal. These valves are perfectly tight, not liable to get out of order; and, in use, they are kept constantly lubricated by the oily hydrocarbons which pass over with the gas from the retorts.

"Where the plan is applied to all the retorts of any gas works, the exhauster may be run with safety, so as to entirely remove the pressure within them.

"This cannot be done where the dip-pipe forms the seal between the retort and the hydraulic main; for the exhaustion of the main above the water line would cause a depression of the liquid within the dips, and open a passage for air from the retorts not in use, and from the open retorts, during the process of drawing and charging them, through the intermediate pipes and apparatus, to the gas-holder; which would not only deteriorate the quality of the gas, but endanger the safety of the entire structure.

"The ingress of air which might lead to such an accident cannot occur where this plan is applied; and it affords the *only safe means which has been devised for conducting the destructive distillation of coal in vacuo* for the manufacture of illuminating gas.

"In practice, the use of the contrivance is very simple. When the retorts are drawn and charged, the valves are closed by means of levers attached to them, within easy reach of the fireman; and, by the same means, they are opened successively, as each retort lid is replaced.

"Should the fireman forget to open a valve at the proper time—a thing not likely to happen, as the lever connected with the valve stands out prominently while the valve is closed, and is observable from one end to the other of the largest retort house—no harm would result; and he would soon be apprised of his neglect by the pressure of gas within the retort blowing out the luting, and the escape of gas at the joint between the lid and mouth-piece.

"The only trouble it would occasion would arise from the necessity of replacing the lid with fresh luting.

"The plan may be considered in every respect a perfectly safe one.

"The invention has been sufficiently long in use to thoroughly test its merits, and demonstrate the benefits to be derived from it."

Gas Well in Mississippi.

A correspondent from Issaquena County, Miss., writes to the *Mining Engineer* as follows: "Last October, on driving a well on the plantation of Gen. Wade Hampton, in this county, at the depth of forty feet, the point of the pipe came in contact with a hard substance (most probably a cypress log undergoing decomposition,) which obstructed its further progress; the pipe was withdrawn, and at a point a hundred yards distant driven the second time, when, at the same depth, similarly obstructed. The gentleman driving the well was on the point of drawing up the pipe, when he noticed, by a noise, that air or gas was escaping; curiosity led him to apply a lighted match to the aperture, when, to his astonishment, a flame shot upward to the height of several feet, and burned with great brilliancy, the color being similar to that given by soda before the oxidizing flame of the blow-pipe. I visited the place a few days subsequently and found it still burning. It is easily extinguished by a gust of wind, but immediately relights and burns upon the application of fire. The gas has now steadily continued to escape for six weeks, from which it may be inferred that a reservoir of considerable extent is beneath the surface.

"The gas is undoubtedly carburetted hydrogen gas, but whence is the material derived that furnishes the gas? There are certainly no coal beds beneath the surface, the land here and for fifty miles toward the interior being *made land*, or, as Prof. Hilgard, in his Geological Report of Mississippi styles it, *bottom land*. There are no signs of the carboniferous formation in Mississippi, except in the extreme north-eastern portion of the State, in the County of Tishamingo, and even here 'its out-crops are comparatively few, and of small extent, in consequence of its being thickly overlaid in most places by masses of pebbles, and other materials of the Orange Sand formation'—(*Hilgard's Geological Report on Mississippi.*)

"The well was sunk at the lower end of Lake Washington, which was, in the memory of some of the oldest citizens now residing here, the channel of the Mississippi River, and during this time the vegetable matter which furnishes the present gas must have been deposited. I have offered the following theory, or rather suggestion, to explain how the matter was accumulated: The Mississippi River, by its immense bends, forms long, narrow peninsulas, the river curving on both sides, the peninsula is narrowed down to a few hundred yards in width, and when no longer sufficiently strong to withstand the pressure, the barrier bursts and the river, rushing through, bears down forests and everything which opposes its course. The identical spot where the well is sunk seems to have been the scene of one of these *cut-offs*. Could there not have been a large forest there at the time, and have been sunk, then covered by mud, silt and sand and afterwards a process toward coal formation commenced, by which carburetted hydrogen gas was generated and confined until set free by the driving of the pipe? If any one can offer a more probable solution for the phenomenon, it will be interesting to many. The formation consists of several feet of surface-soil, composed principally of vegetable matter, then alternate layers of sand and blue clay. The soil contains by qualitative analysis of insoluble matter, (chiefly silica) about 70 per cent., and also some soda, potash, lime and alumina, oxide of manganese, a considerable quantity of the peroxide of iron, carbonic, sulphuric and phosphoric acids, and organic matter—the latter particularly in the surface soil. I am unable to give the proportions, having as yet made no qualitative analysis. The soil is so strongly impregnated with the peroxide of iron, that the water from other wells sunk in the vicinity is soon coated with a mirror, after being exposed to the action of the air."

A Peculiar Boiler Deposit.—This deposit was formed from Croton water in a boiler, which, by a special arrangement of the steam-pipes, received the condensing waters back again. It had a light brown color, of the specific gravity of water, floating thereon, and had the following composition according to an analysis by Dr. Schweitzer:

Water	1.95	per cent.
Oil (extracted by ether)	20.76	"
Organic and volatile matter	45.23	"
Inorganic residue	26.06	"
The residue consisted of—		
Silicic acid	2.52	"
Stannic acid	1.68	"
Iron and alumina	3.62	"
Carbonate of lime	18.08	"
Magnesia	some	
Sulphuric acid	none.	

These latter percentages apply to the original mass.

Annual Report of the Bath (Me.) Gas-Light Company.

The following is the yearly report of the Bath Gas-Light Company from Jan. 31, 1870 to Jan. 31, 1871, which we trust will be interesting to the gas fraternity. We earnestly solicit similar reports from other gas companies;

RECEIPTS.

Sales of gas	$11,921 71	
" coal, tar, and coke	170 05	
Rents	80 00	
Notes Payable	2,300 00	
Profit and Loss	4,555 29	
		19,027 05
Cash on hand Jan. 31, 1870		2,618 07
		$21,645 12

PAYMENTS.

Dividend no. 16	$2,049 00	
Sundry personal accounts	569 07	
Notes to National Banks	2,300 00	
Coal	5,925 50	
		10,843 57
Lime	181 20	
Abatements	134 26	
Salaries	1,250 00	
		1,565 46
Government Internal Rev. Tax	300 85	
Gov't License to Manufacture	10 00	
City Tax, $690; less dis. $34 50	655 50	
		966 55
Pay roll at the "Works"	1,106 28	
Notes and bills receivable	217 71	
Expenses	375 34	
Repairs	343 83	
Meters	269 58	
Interests	6 36	
Gas bills—uncollected	1,089 30	
		3,408 40
		16,783 78
Cash on hand		4,861 34
		$21,645 12

ASSETS.

285 tons of coal, at $9	$2,565 00	
20 casks lime, at $1.30	26 00	
900 gals. coal tar, at 5c	45 00	
700 bush. coke, at 6c	42 00	
		2,678 00
48 Meters	283 69	
1 connection	1 00	
133 feet wrought-iron pipe	25 98	
		310 67
Clay retort, fire brick, tiles, Gas Pipe, etc		129 00
Notes and bills receivable	217 71	
Gas bills uncollected	1,089 30	
Cash in hands of Treasurer	4,861 34	
		6,168 35
		$9,286 02

LIABILITIES.—none.

We have carbonized 779,000 pounds of Provincial and Westmoreland Gas Coals,—making per station meter 7,904,960 cubic feet of gas; have delivered to consumers 2,649,252 cubic feet. Allowing for the quantity remaining in gas-holder 15,000 feet, and 10,000 feet used at the works, leaves 230,718 feet for condenstation and waste, about 9¼ per cent. We have 272 consumers, 22 Street lamps, and about 3 miles of Street Mains.

Capital Stock, 690 shares at $100 per value amounting to $69,000

Bath, Jan. 31, 1871.

Chas. Clapp, Jr., Treasurer.

The following illustration, says Professor Henry, of the vibratory movement of matter is attested by Professor Horsford. The top of the high tower which constitutes the Bunker Hill Monument inclines towards the west in the morning and the north at mid-day, and towards the east in the afternoon. The movements are due to the expanding influence of the sun as it warms, in succession, the different sides of the structure. A similar but more marked movement is produced on the dome of the capitol at Washington, as indicated by the apparent motion of the bob of a long plumb line fastened to the under side of the roof of the rotunda and extending to the pavement beneath. This bob describes daily an ellipcoidal curve, of which the longer diameter is four or five inches in length. By molecular actions of this kind, Time, the slow but sure destroyer, levels with the ground the loftiest monuments of human pride.

Chemical Repertory,

No. 50.—April 3, 1871.

EDITOR—HENRY WURTZ.

A NEW INSTRUMENT FOR DEMONSTRATION IN PUBLIC LECTURES.

(REPORT OF AMERICAN INSTITUTE MEETING.)

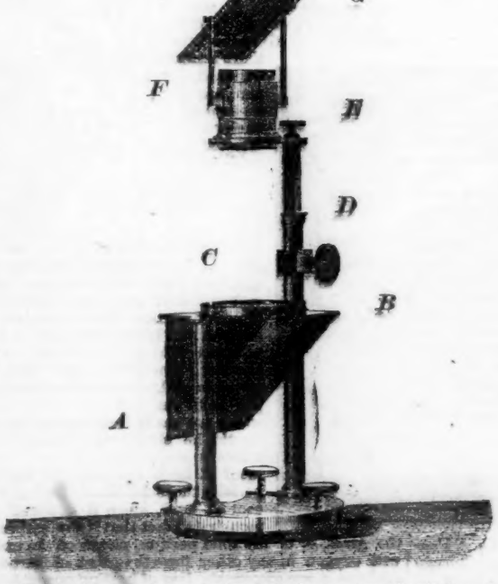
[Communicated Exclusively to this Journal.]

At a late meeting of the American Institute, Prof. MORTON exhibited a new instrument which he had lately devised, and which, by the beauty and singularity of the effects it developed, excited many expressions of approbation. The object aimed at was to produce on a vertical screen, enlarged and brilliant images of objects which required to be maintained in a perfectly horizontal position, such, for example, as waves in a tank of water, cohesion—figures of oils and other liquids, magnetic spectra and the like.

In a few introductory remarks the Professor observed that many efforts, attended with more or less success, had been made before with the same objects in view; thus Faraday and Tyndall had turned an electric lantern over on its back, so making the condensers horizontal, and the object being placed upon them, its image was either projected on the ceiling or reflected to the wall. The inconvenience of this plan was, however, very great as would readily be perceived.

His attention was first drawn by Prof. Cooke of Cambridge, to another plan which that gentleman had employed for several years. In this case the lantern stood in its usual position and a mirror placed in front at an angle of 45° reflected the light upwards through the horizontal object and object glass, beyond which, a mirror, silvered on the outside by Foucault's plan, reflected it to the screen.

The difficulty here, however, was that the object being removed to a considerable distance in front of the condensers, a very much discolored and unsatisfactory field of light was obtained on the screen. To meet this difficulty, he had therefore constructed the instrument as follows:



The lantern condenser in the first place was made of three lenses, the first two of such curve as to give with the light at about two inches from the nearer one, a practically parallel beam, which was received upon a mirror AB at 45°, and after reflection from it fell upon the third lens placed horizontally at C, which concentrated it on the objective at E, from which it passed to the mirror FG, which in turn threw it on the screen. This mirror, moreover, was not silvered on the exterior surface, but in the usual way, though with pure silver, on the back, and yet no want of definition was to be perceived in the image, owing no doubt to the fact that the faint reflection from the first surface was inappreciable in comparison with that from the metallic silver. In several articles published in the *Chemical News* and elsewhere, a square prism had been described as being used for the same purpose, but al ittle thought, or still better, a moment's experiment would show that this means would not answer, because about one third of the cone of rays entering the prism, would be at too great an angle for total reflection, and would thus leave one third of the field dark. The apparatus had been constructed by Messrs. Hawkins and Wale, to whose judgment and workmanship it did great credit. The apparatus was then put in operation, being illuminated with the lime light, and there was first shown a magnetic spectrum, preparen and fixed on glass by an ingenious process devised by Professor A. M. MAYER. This showed the sharpest definition that could be desired. Iron filings being then evenly scattered over a plate of glass, a small steel magnet was placed beneath, and the glass lightly tapped with a pencil point, when the filings were seen to fall into rank, and to arrange themselves in the graceful inflections of the magnetic curves. A tank of water was next introduced, and by means of an ingenious contrivance devised by Messrs. Hawkins and Wale, series of waves were developed, and their reflections from the sides of the tank, interferences, and other phenomena, were beautifully exhibited. The apparatus for producing the waves consisted of a metallic box with a sheet rubber cover, provided with a long thin metal tube; this was so placed that the tube was about one-quarter of an inch above the point in the tank which it was desired to make the centre of the wave motion. On tapping the rubber diaphragm a momentary puff of air was driven from the tube, producing exactly the disturbance needed. An eliptical ring being placed in the tank, the properties of that curve with regard to reflection, were very neatly exhibited, and in fact independent of their scientific interest, nothing could be more charming than the pearl gray waves crossing and interlocking and combining in complex patterns, which raced across the screen.

Cohesion figures produced by letting fall drops of ether, alcohol, carbolic acid, oils of cinnamon, coriander, cloves, etc., on the surface of water were then exhibited, and attention was directed to many other experiments, such as the electric decomposition of metallic solutions, sound figures and the like, for the exhibition of which this instrument was especially adapted.

In this connection we may remark, that it was with the lower portion of this lantern that the vertical illuminated fountain described by us on page 51 of this Journal, was illuminated. The water running in to a circular box provided with a series of concentric wire gauze cylinders, having a glass window below, an outlet in the centre above and being placed on the top of the third condenser, as is shown in the accompanying woodcut.

[ORIGINAL COMMUNICATION.]

A REPORT ON PETROLEUM-NAPHTHA GAS, TO THE PRESIDENT AND BOARD OF DIRECTORS OF THE FORT WAYNE GAS-LIGHT COMPANY.

By HENRY H. EDGERTON, Superintendent.

FORT WAYNE, IND., March 10, 1871

Prof. HENRY WURTZ.

Dear Sir: I send you a Report on Naphth Gas, which may be of interest to you.

As mentioned therein, I hope you will do me the favor to publish a series of experiments, that they may come before gas men generally. My desire is to do this process exact justice, neither to over nor underrate it, and at same time not to push it into view of speculators—therefore I send in advance the pamphlet.

* * * * * * *

I may also announce to you with confidence, that I have discovered substantially a chemical corroboration or proof of the "Rule of Squares"; which rule I see questioned by leading experimentalists.

I own to feeling annoyed, at finding not only the public (*vide Philadelphia Ledger*) but gas men also, giving the credit of the discovery of this rule entirely to Mr. Farmer.

I don't want to detract from Mr Farmer's credit. Mr. Smedberg unfortunately did not answer my letters on the matter, or I should have been able to present the "Rule of Squares" according as I had proved in January, 1868. In fact in 1867, I was experimenting with a view of substantiating it.

With respect, your obedient servant.

HENRY H. EDGERTON.

SIR: I have the honor of submitting the following report upon the Gas called Petroleum Naphtha Gas, now made in Memphis, Tenn., by a new method, known as the "Brown and Rand process," or "Saratoga process."

It is unnecessary to explain the mechanical details—they are exactly the same as in the experimental apparatus now working here, both in detail and principle.

The material used is petroleum benzine, (or any hydro-carbon vaporizing below a red heat,) having the general chemic l constitution $C_{2n}\,H_{2n}+2$. The vapor is passed into a retort, and there converted by heat, into permanent and illuminating gases of the general formula $C_{2n}\,H_{2n}$, $C_4\,H_4$, $C_2\,H_4$,—these different compounds varying in proportion according to the heat employed, and the density of the petroleum benzine vapors. In regard to the possibility of decomposing petroleum benzine vapors into a permanent gas of the above constitution, there exists no possible doubt and that, too, with less destructive decomposition, than with any other known hydro-carbons. The reason is apparent upon viewing the relations of carbon and hydrogen in petroleum benzine. The measure of destructive decomposoition in this process, is the amount of marsh gas ($C_2\,H_4$) and hydrogen formed, relative to the density of the petroleum naphtha vapors employed. It may be safely assumed that the greater the density both of the liquid and vapor—the higher is the condensation of $C_n\,H_{2n}+2$. The conclusion may be drawn from this, that relative to a fixed and necessary volume of [$C_2\,H_4$] marsh gas, the light

er the gravity of the petroleum naphtha employed, the less will be the destructive decomposition. This relation of yield, composition, and loss by deposit of carbon, to the specific gravity of the petroleum naphtha employed, is shown in the experiments before you. It seems that in practice, as at Memphis, the destructive decomposition is controlled at a minimum, for only in one specimen in above twenty analyses was there any free hydrogen, and that only to the extent of nix per cent. A number of gas engineers, it is understood, consider petroleum naphtha as so analogous to coal tar naphtha that no permanent gas can be made from either in profitable quantities. This is undoubtedly true of coal tar naphtha, chemical constitution C_{2n} H_{2n-6}; there is not enough hydrogen to carry the carbon in the gaseous state without immensely destructive decomposition.

Taking benzole for instance (C_{12} H_6), six atoms of carbon representing nearly *half the weight* of the substance has to be deposited before a permanent gas of the constitution C_6 H_6 is obtained, and I suppose it is a fact that the decomposition cannot be arrested, and controlled at this point; thus, although similar in physical characteristics and appearance, coal tar and petroleum naphthas are so dissimilar in chemical constitution, that it is impossible to control the decomposition of the one into a fixed gas, with any profit—while the decomposition of the other is controllable with ease and profit.

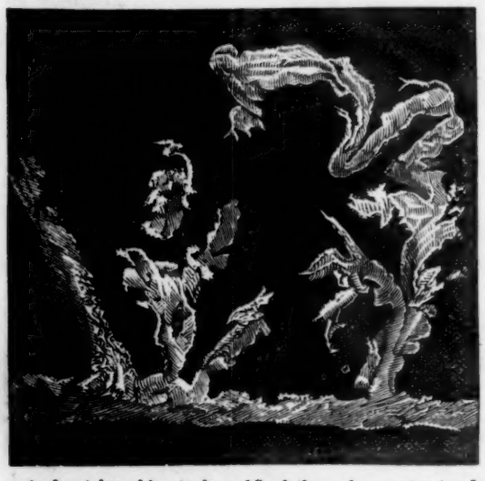
[Mr. EDGERTON here introduces a Table of Analytical Results, which we reserve, with other analyses, for a subsequent issue.]

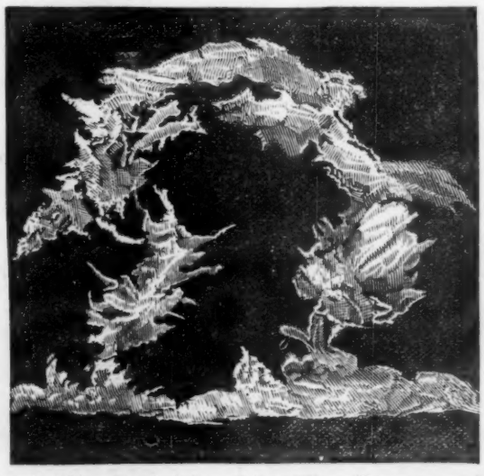
[To be continued.]

POPULAR SCIENTIFIC LECTURES AT THE STEVENS INSTITUTE OF TECHNOLOGY IN HOBOKEN.

We have just received a very handsomely executed pamphlet containing the announcement and synopsis of a course of Popular Lectures at the place above indicated.

This Institution, about which we shall give our readers more detailed information subsequently, is to be a shool of Mechanical Engineering of a high order. It is munificently endowed by the late EDWIN A. STEVENS and under the Presidency and most able management of Prof. MORTON, is being fitted up with every means of illustration and investigation which can be made available. When we mention that a full *Photometric Appartus* from SUGG of London, a Photographic outfit, a complete set of instruments for Electrical Measurement from ELLIOT; Microscopes, Dividing Engines, Chronographs, and all the most refined instruments of precision which have been developed by modern science; as well as a Steam Engine and a





set of metal-working tools such as lathes, planers etc., are included in the outfit, some idea will be formed of the extent and thorough character of the preparation which is being made.

It is proposed to open the collegiate course of this school next September, and in the meantime to utilize some of its resources for the benefit of the pubiic at large, by a course of popular lectures, which it is also proposed to continue in subsequent years.

Hence the announcement, one of whose illustrations we are permitted, terough the kindness of Prof. MORTON, to present to our readers.

This represents two remarkable groups of solar prominences as seen and drawn by Mr. J. N. LOCKYER, of England, some of whose remarkable discoveries in connection with the astronomical applications of spectroscopic research, we have from time to time, republished.

The course of lectures beginning on Wednesday, March 19th, includes three on Light, by President MORTON, one on the Atmosphere by Prof. SILLIMAN, two on the Spectroscope by Prof. BARKER, four on Sound by Dr. COHEN, and one on Magnetism by Prof. A. M. MAYER.

Since the above was written, we have had the great pleasure of listening to the first lecture of this first Stevens Institute Course by the Preident on the "Nature and Sources of Light," on the evening of March 29th. Of the diagrams used in illustration, by means of his unequalled optical apparatus, the above elegant cut will furnish an example. None of our city readers should fail to attend, if possible, the further lectures of this course, at 8 P. M., April 5, 12, 20, 27; May 4, 11, 18, 25, and June 1 and 7. H. W.

The Bituminous Coal Trade for 1870.

The total production of bituminous coal in this country, in 1870, amounted to fully 18,000,000 tons. The bituminous trade bids fair to eclipse the anthracite in a few years. The latter amounted last year (as far as reported in Pennsylvania) to only 16,889,505 tons. In Boston, in 1870, the anthracite trade fell off 36,400 tons, while the bituminous increased 49,600 tons. During the past year, the Baltimore and Ohio Railroad, with the Chesapeake and Ohio Canal, brought to market 1,717,075 tons of Cumberland coal, a decrease of 165,000 tons. The Huntingdon and Broad Top Railroad transported 313,822 tons a decrease of 46,850 tons. The Tyrone and Clearfield branch of the Pennsylvania Central carried 345,000 tons of the Phœnix Vein, while the Allegheny Mountain mines shipped 90,000 tons, mostly for local consumption. The Blossburg and the Towanda mines, which largely supply New York State and the Lake region, supplied, as near as can be ascertained, 500,000 tons. Thus, the total consumption of bituminous coal, for iron, steam and domestic uses, on the seaboard north of Cape Henry, aggregated 3,000,000 tons.

In addition, the gas coals of Western Pennsylvania and Virginia gave 1,500,000 tons, of which one-half was brought Eastward by the Pennsylvania Central. The statistics of the Western bituminous trade are only approximate. It is an authenticated fact that Pittsburg, besides consuming locally 600,000 tons, shipped 2,000,000 tons down the Ohio at $2 each; yet so inadequate was the supply that it commanded $8 a ton at Memphis. Cleveland received, for its own consumption and for transportation on the lakes, nearly 1,000,000 tons, by the Cleveland and Pittsburg, and the Cleveland and Mahoning Railroads. The great West and Northwest, taking the statistics of the "Panhandle" and the Pittsburg, Fort Wayne and Chicago Railroads, consumed an additional 2,000,000 tons. As near as can be ascertained, the Indiana, Illinois, Michigan and Kentucky mines yielded nearly 4,000,000 tons: and to these are to be added the productions of the vicinity of Richmond, Va., of Alabama and Tennessee.

In view of this great and increasing production, the strikes of the anthracite miners will yearly become of less practical value. A silent revolution is at work in the coal trade. Baltimore seems to be losing supremacy on the seaboard once held by the Cumberland coal, owing to the valuable tracts opened up in Clear county, Pa., during the last three years: but by the completion of the Cumberland Valley Railroad to the Potomac river, Baltimore retaliates by a sharp competition in the iron manufacturing regions of Central Pennsylvania. And while Philadelphia enjoys the benefits which Baltimore had by her Cumberland, this city, in turn, will loose command of the gas coal trade by the completion of the Pittsburg and Connellsville Railroad, opening up to Baltimore and the seaboard the rich gas coals of the Youghiogheny Valley. The present year promises to make some other important changes in the coal trade.—*Correspondence New York Tribune.*

Consuming Smoke.

Some interesting experiments were lately made in Ohio, with a view to ascertaining the best method of consuming the smoke of soft-coal furnaces, and, after a careful examination and test of a number of mechanical appliances designed to effect this object, the conclusion was reached that nothing was so simple and effective in preventing the escape of smoke as the introduction of sufficient oxygen into the furnace to effect complete combustion of the fuel and thus prevent the formation of any smoke at all. This is a fact to which too little attention is paid by those entrusted with the management of furnaces. Taking bituminous coal as containing 80 per cent. of carbon, which is the average amount, it will require for its complete combustion in the furnace a supply of 340,000 cubic feet of air—100,000 cubic feet being required for the consumption of the gases generated by the coal, and the remainder for the coke and solid portion of the fuel. The best place to introduce the air for the gases is at the bridge-wall, and it should be divided into as many small streams as possible, taking care, however, that it is intermingled with the gases before they are reduced below a temperature of 800 deg. Fahrenheit, since below this temperature flame cannot be produced nor sustained. The remaining 240,000 cubic feet of air must, of course, be taken through the grate bars. This is the amount of air that is chemically required for the complete combustion of a tun of soft or bituminous coal; but as about one-half of the oxygen taken in with the air passes off without mixing with the proper amount of carbon for its ignition, a great deal more will be needed.

For the consumption of one cubic foot of coal gas, it has been found that two cubic feet of oxygen are required, and to furnish this ten cubic feet of atmospheric air must be admitted to the furnace. To consume the coke, or mixed portion of the fuel, after the gas has been expelled, sixteen pounds of oxygen are required for every six pounds of carbon; and allowing bituminous coal to contain 80 per cent. of carbon, there remains, after the gas has been expelled, 1,600 pounds of coke to the tun, requiring an amount of oxygen equivalent to 2,400 cubic feet of air, the product of the combustion thus effected being transparent carbonic acid gas. If, however, the proper amount of oxygen is not supplied, the result of the imperfect combustion is carbonic oxyd, or else a dense black smoke, composed of the hydrogen and carbon of the fuel that has not been supplied with the requisite proportion of oxygen. The carbonic oxyd is a compound of one atom of carbon with one atom of oxygen, and is also transparent like carbonic acid gas, but which, with another atom of oxygen, becomes carbonic acid. These are very simple facts in practical chemistry, which are easily learned, and which should be clearly understood by all who are responsible for the managment of large coal furnaces, and especially those in which bituminous coal is used, since it is a well demonstrated fact that if the carbon of the gases, or of the solid portion, passes off in union with oxygen in any other form than that of carbonic acid gas, a commensurate loss of heating power is the result. In view of these facts, which are demonstrated not by experimental tests merely, but by long practical experience in Europe and elsewhere, there can be no doubt that if consumers of bituminous coal would pay more attention to the proper introduction of oxygen into their furnaces, they would be amply repaid in a saving of fuel, and, at the same time, prevent in a great measure, if not wholly, the "smoke nuisance" which, in Pittsburgh and many of the principal manufacturing cities of the West, has become so intolerable within the past few years.—*Iron Age.*

The water works tunnel at Buffalo, has been extended sixty feet into the lake. The tunnel is to be nine feet in diameter and over 700 feet long.

On Ventilation.

[Selected for this Journal.]

It has been repeatedly proved that gas (for a given quantity of light produced) is more salubrious than any other material employed for artificial illumination; but on its introduction anywhere, a considerable increase of light is invariably required, when a proportionate increase of heat and noxious products are the natural result, and in consequence additional care must be adopted, so that the ventilation should be in accordance therewith. For the purpose of making the subject of ventilation intelligible, I will submit to the reader a few observations on the chemical nature and properties of the atmosphere, together with the compounds formed during combustion and human respiration.

As already stated, the air we breathe is composed of two gases, oxygen and hydrogen, in the proportions of about one-fifth part of the former and four-fifths of the latter. Oxygen may be termed the "aerial food" for fire and animal life, as both are entirely dependent upon it for existence. The nitrogen may be considered the diluent of this, and possesses no life-sustaining properties.

To illustrate the action of oxygen: If a glass tumbler or similar vessel be inverted, on placing a lighted taper therein, gradually the flame diminishes, and is speedily extinguished—this being due to the oxygen of the enclosed air combining during combustion with a portion of the material forming the taper, which assumes the gaseous state, so producing a poisonous compound gas (called carbonic acid) which suffocates the flame. But if previous to extinction a stream of oxygen gas were to be injected into the inverted vessel, the flame would revive, and burn with an intensity proportionate to the quantity of that gas supplied.

Or if a number of persons be assembled together in a confined place where the supply of fresh air is limited, they, by the process of respiration, in a manner analogous to the action of the fire, vitiate the air and produce the same poisonous compound as that, and when air is contaminated with this, it is productive of lassitude, headache, and sickness to the persons breathing it. Should the atmosphere inhaled by the lungs contain only one per cent. of carbonic acid, it is exceedingly unhealthy: and when it contains from three to four per cent. of that, persons breathing it would speedily die; but by the timely administration of oxygen gas, or fresh air, of which it is a constituent, the calamity would be averted.

Again, if a person were to descend by means of an ordinary diving-bell into water, without any communication with the atmosphere; in a short time the small quantity of air contained in the bell would become empoisoned by the emanations from his lungs, and death would ensue; but by resorting to the science of chemistry, and providing himself with a store of oxygen gas sufficient for the time he wishes to remain beneath the water, and being further provided with the means of absorbing the carbonic acid produced: with impunity he may then continue submerged for a considerable time without fear or danger.

Thus we learn that oxygen, or fresh air which contains it, is most essential to fire and animal life, that when it contributes to the one or the other a poisonous compound is formed which when breathed even in a limited quantity is injurious to the human frame. This poisonous compound may be formed so as to be pernicious by one person or many, dependent on the locality and means of ventilation. Or it may be produced by lights, as candles, lamps, or gas, burning in an enclosed place. Lastly, by resorting to proper means, the evils arising from this pernicious compound may be averted, which is the object of proper ventilation.

The enormous quantity of carbonic acid continually being produced from animal life and fire, is absorbed by trees and plants, which in their turn give out the oxygen thereof in a pure state, retaining the carbon for their growth. Like all other gases carbonic acid is readily diffused, and, aided by the winds, is carried in all directions from cities and towns, where it is largely generated, to supply the vegetable kingdom. Following this law, every facility should be given to all buildings to permit the vitiated air to escape, and for the free admission of fresh and pure air.

There is another effect produced from flame of all kinds, that is the production of vapor or water, caused by the oxygen of the atmosphere combining with the hydrogen, constituting a portion of the material consumed, and in the act of combustion, water is produced, which exists as vapor in the air wherever there is a flame, therefore in proportion to the gaslight so will be the amount of vapor formed. A similar process takes place with animal life, for at each expiration, vapor intermixed with the breath is expelled, which may be made evident by condensing it on a cold looking-glass or other similar object. In cold weather this is a very perceptible when issuing from the mouth. There is alro a considerable quantity of vapor given off by the pores of the body.

The presence of these vapors is made palpable in several ways: firstly, if a decanter of iced or very cold water be taken into a room which is apparently quite dry and warm, speedily the surface of the decanter is covered with a thick dew, caused by the vapor floating in the air, being condensed thereon by the action of the cold water within. Or in frosty weather, where a gaslight is burning in an apartment, the vapor arising therefrom will be condensed upon the glass of the windows, and become frozen.

The same effect is witnessed in bedrooms when a portion of the vapor given off by the occupants is frozen on the glass, and on a frosty morning, in passing through the streets, by observing the frost upon the windows, one may indicate with tolerable accuracy the various rooms which have been inhabited during the night.

We have therefore in ventilation two considerations—the one to have the full quantity of fresh air necessary to our health and comfort; and in certain places to avoid the accumulation of vapor, which may be highly destructive to many classes of merchandize; and although the means employed for the effectual fulfilment of the first requirement would accomplish the second, still it is better to embrace the two subjects, as the latter will explain many causes of complaints of gas consumers.

The effect of the heat and vapor from combustion is frequently very objectionable; for instance, a wareroom or shop, the lower part of which may be only at a temperature of from 60 deg. to 70 deg., in consequence of the hot air ascending, and there being no means of its escaping, the temperature near the ceiling in the same apartment will probably be 130 deg. or 140 deg. Therefore when goods or books exist in such localities, and are subjected to this high temperature and corresponding vapor, it cannot be a matter of surprise if they become injured or destroyed. Yet the preventative is exceedingly simple; but instead of being applied, the defect is at once attributed to the bad quality of the gas. For the proper protection of goods when placed in such localities, a thorough system of ventilation is necessary, so as to permit the hot air and vapor to pass off freely from the upper part of the premises.

When gaslights are in enclosed places, as shop windows, good ventilation is indispensable, or the vapor will be condensed upon the glass, entirely obscuring it. Sometimes in winter this is found to be frozen on shop windows in the morning on opening them, and appears a mystery. However, this can only arise from a person or persons having slept in the locality, or from a gas or other light having been burned there.

Although apparently so simple, the general question of ventilation is very difficult to treat with, for sometimes the means adopted to ensure a good supply of fresh air may answer admirably for a period, but unexpectedly, perhaps, from a change in the direction of the wind, suddenly it is found to be defective, and to the great disappointment of the proprietor of the premises the system has to be abandoned. Arrangements which may be perfection in calm or warm weather, are often highly objectionable in cold or boisterous weather, when, instead of the noxious products of combustion passing off, the reverse takes place, and the flame is caused to become smoky and agitated, necessitating a discontinuance of the mode of lighting.

In warehouses, shops, apartments, etc., where gas is much used, and defective ventilation exists, one or more openings should be made in the highest part of the locality, which openings may be regulated by a valve or valves, and these should be under control as desired according to circumstances. The number and size of such openings will depend on the dimensions of the building, the number of persons generally assembled there, and the lights employed. They may be led into a staircase, passage, or other similar place where the noxious products of combustion and respiration will become cooled, and, being heavier than the atmospheric air, will descend and be diffused. When ventilating openings communicate direct with the open air, the serious inconveniences of sudden draughts are to be contended against, for in all places there is a particular point from whence the wind blows which at certain periods causes considerable annoyance. This, however, may be remedied to a great extent by closing the orifice with a sheet of pierced zinc or wire cloth, which has the effect of checking the evil.

In order to permit the vitiated air to issue with every facility, openings should exist in the lowest part of the apartment for the admission of fresh air: and if carefully distributed in a series of small orifices, at the back of, or in the skirting boards, then no draught will be perceptible. If the supply of fresh air be regulated by a valve similar to that mentioned for the egress of the vitiated air, this system of ventilation will then be found admirably adapted for either winter or summer. The error is often committed to leave a large opening in the roof or ceiling for the emission of the impure air, without making any provision in the lower part for the supply of fresh air. Under such circumstances, proper ventilation is impossible.

In many modern-built first and second-rate houses, the architect makes provision for ventilation by constructing main air flues, which pass from the bottom to the roof, but terminate inside, so as not to receive the direct action of the various winds. Into this are conducted the branch air flues, which receive the vitiated and heated air from the various apartments, and so carry it away. This system is highly recommended, and it is desirable that it should become more general.

The importance of a good system of ventilation cannot be overrated; but frequently people by use, become habituated to breathe impure air, in some workrooms it is often unsupportably injurious to those who enter casually, yet the occupants experience no inconvenience from it at the time, but slowly it does its baneful work, and many cases of consumption have their origin from this.

Badly-ventilated workrooms and workshops are detrimental in a commercial point of view, for those persons who inhabit them have considerably less energy than they would possess were proper ventilation established, and in consequence less work is done. Therefore it is directly the interest of employers to consider well this important question.

It often happens during public or private assemblies, that the atmosphere is rendered so insupportable by the persons and the lights, that weariness and headache are the consequences—thus marring the pleasures of the evening, and carrying its injurious effects with it the following day. Fresh air costs nothing, therefore bad ventilation should be always avoided, for assuredly when this exists, its pernicious effects will be made manifest sooner or later, to a greater or less degree, in those persons who are subjected to its influence.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily r publication, but as a guarantee of good faith.—EDS.

Answer to "W" and "X" on the Dip-Pipe Question.

NEW YORK, March 24, 1871.

MESSRS. EDITORS: Retorts and their surroundings seem to me to have a kind of epidemical existence in your valuable Journal. For so sure as the sun begins to show signs of his increasing vitality, so sure is the question of retorts to arise with something new under that luminous constellation. The question now before us is the dispensing with the dip-pipes in the hydraulic main; and with such the abandonment of (the familiar friend to the gas man) the hydraulic main, and the substituting the Gibson valve. With your permission I purpose examining this question from a practical point of view, calling by the way upon "W" of February 16, and single "X" of March 16, whose logic appears to me far happier than their reasoning deductions.

Since the introduction of gas the hydraulic main has boldly stood preeminent; apparently a perfect, simple, and reliable machine; virtually requiring no human aid to keep it in working condition. I must therefore be excused from believing any *ex parte* statement attributed to the Gibson valve, as a variety of circumstances might bring about the favorable results named, without being in the least affected by the use of the valve. The production of solid carbon in the retorts is due to several causes, far more intimately associated with clay retorts than iron ones—with old ones more than new; but the greater the heat the more rapid the accumulation. Some coals again deposit solid carbon more freely than others. I have always found where there was an abundance of sulphur there was also an abundance of solid carbon, The question of pressure which this system is supposed to obviate is purely theoretical, even if it were desirable to take the whole of the pressure from the retort. From the circumstance of the case it is not possible neither is it desirable if the pressure is kept within the limits I suggested last year.

A gas retort may be considered in the same category as the boiler of a steam engine, it being the producin agent; consequently there must be a certain pressur

in the retort until you make the exit pipes as large as the retort itself; but such is neither practical nor desirable.

With reference to the communication over the signature "W," taking as I do an entirely different view of the subject to your correspondent, I will pass over the first and second paragraphs, and proceed to answer the similitude, when comparing the flow of gas from the retort to the flow of water through pipes, and their consequent enlargement through the sudden check of the stop-cock. He is altogether wrong in his premises, he having left out of consideration entirely the difference of force of the two things, which is the very essence of the whole matter—the gas being forced into the hydraulic main at the same pressure as a man could blow from his mouth, while the pressure from the flow of the water is sufficient to force itself into a boiler working up it—30 lbs. pressure. The gas in the dip pipe passes off so easily into the hydraulic main that I cannot think the alteration an improvement.

With reference to the argument over the signature "X" the whole subject is, whether "W," "X," or "Y's" explanation is the best. The question of setting retorts is by far a greater matter, and on which the success of every gas works in a great measure depends. Respectfully yours,

JOHN KEELING, Gas Engineer.

The Dip-pipe Again.

NEW YORK, March 28, 1871.

Messrs. Editors: Your correspondents "W" and "X" have endeavored to account for the influence which the dip-pipe exerts, in causing the deposits of coal carbon which takes place in gas retorts. Their communications remind me of the efforts made to solve the problem, "*Why a live fish weighs less than a dead one*," without first enquiring as to the fact. I am slow to believe that so trifling a pressure as the dip-pipe occasions in well constructed gas works, such as those of the Manhattan Gas-Light Company, and many others, where the dip does not exceed half an inch, can be the cause of the difficulty in question, but am rather inclined to attribute it to the retorts being over heated. I am free to confess that I have had no experience in the use of the so-called "Gibson Improvement," and may add that I am inclined to give to it all the credit which is its due, more especially as it seems to have found favor in the columns of the GAS-LIGHT JOURNAL. If those who have tested it would give the result of their experience it would, I think, confer a favor upon many of your subscribers, as well as I am sure it would upon A CONSTANT READER.

On Subways for Gas and Water Mains.

PITTSBURGH, March 23, 1871.

Messrs. Editors: There seems to be some misapprehension on the part of some of our gas engineers as to the method or manner of constructing subways for gas and water mains. The suggestion of the *American Artisan* respecting a blast apparatus to be furnished in connection with the shafts, would indeed be an expense without much benefit. The plan I spoke of in a former issue of your valuable Journal, of ventilating the tunnel with iron gratings, at distances of about seventy-five or one hundred feet apart, along the middle of the street, communicating direct with the center of the arch or ceiling of the tunnel, making good, sound joints as we make them in Pittsburgh, there will be no danger of explosion from accumulated gas, because there would be a swift current of air continually passing through, and any escape of gas must necessarily be carried away without any injurious effects. If necessary I will furnish a model, so that some of our engineers may have a better idea of constructing a subway for gas and water.

Yours respectfully,

HARRY HYAMS,
Sup't Hyams Meter Company.

Trouble with Wet Meters.

EASTON (PA.) GAS WORKS, March 23, 1871.

Messrs. Editors: For the past two years I have had considerable trouble with the wet meters. The drum appears to rub and stick fast. By taking them apart I find there is a hard substance on the journal of the drum shaft, and on the wheel on the end of shaft. I think it is caused by hard limestone water. Do you know what is the best way to remove it. I think there could be something put into the meter to soften it, so it could be removed. Can you or some of your readers give a remedy, and oblige S. T.

[See "Answers to Correspondents."]

Leakage in Gasometers.

NEW ORLEANS, March 22, 1871.

Messrs. Editors: I would like to get a receipt for stopping leaks in gasometers. I have tried several; they were either softened by the oil from the gas, or too hard, and cracked with the working of the holder.

I remain, respectfully,

F. C.

[See "Answers to Correspondents."]

Smedberg's "Synopsis."

The following additonal subscribers to the above work are herewith acknowledged, making 340:

E. B. Parsons, Sec'y Auckland Gas Co., New Zealand, by Chas. C. Rodes, Atlanta Gas Co., Ga.
Charles Collier, Selma, Ala. (Manchester, Eng.)
Citizens Gas Co., Cedar street, Newark, N. J.
H. W. Robinson, North Bridgewater Gas Co., Mass.
C. Wheat, Sup't Geneva Gas Co., N. Y.

Gas—The Metropolitan Gaslight Company of Brooklyn have addressed a letter to the gas committee of the Common Council, in which they request a delay of thirty days before entering into contract with the old gas companies to light the streets and pulic buildings for the present year.

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Albertite of New Brunswick	$16 00	@	17 00
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On granting the Extension	50
On filing a Disclaimer	10
On filing application for Design (3½ years)	10
On filing application for Design (7 years)	15
On filing application for Design (14 years)	30

RECENT AMERICAN PATENTS.

Pertaining to the Specialties of this Journal, for the three weeks ending March 25th, 1871.

112,396.—Street Lantern.—Augustus, Malden, Mass.
112,420.—Steam Engine Governor.—C. A. Conde, Indianopolis, Ind.
112,422.—Rotary Pump.—F. O. Deschamps, Philadelphia, Pa.
112,451.—Valve for Steam Engines.—Joseph L. Barley, Baltimore, Md., and Xaver Fendrich, Georgetown, D. C.
112,491.—Rotary Pump.—George W. Putnam, South Glens Falls, N. Y.
112,557.—Gas Retort.—Darius Davison, New York city.
112,591.—Rotary Steam Engine.—A. S. Harlan, Bloomington, Ill.
112,593.—Gas Retort.—Geo. W. Harris, Elizabeth, N. J.
112,711.—Safety Valve.—Stewart C. Marsh, Newark, N. J.
112,618.—Pipe Connection.—Jas. M. Moreland, Brooklyn, N. Y.
112,637.—Gas Burner.—Mark Rosenwax, New York city.
112,647.—Water Wheel.—Pierce W. Yarrell, Littleton, N. B.
112,722.—Meter.—Albert D. Laws, Bridgport, Conn.
112,761.—Portable Steam Generator.—J. E. Woodruff (assignor of one-half his right to J. F. Rowley), Buffalo, N. Y. Antedated March 6, 1871.

FOREIGN PATENTS.

251.—Vapour Engines.—J. A. H. Ellis, Springfield, Vt.
351.—Engine Governor.—R. K. Huntoon, Boston, Mass.
452.—Carbureting Air.—A. E. Dupas and A. Barbarin, New Orleans, La.
475.—Gas Burners.—A. E. Dupas, New Orleans, La.
517.—Ammoniacal Gas Engine.—E. Lamm, New Orleans, La.
596.—Gasaliers.—J. Hortan, New York city.
602.—Safety Valve.—G. H. Clemens, Chicago, Ill.

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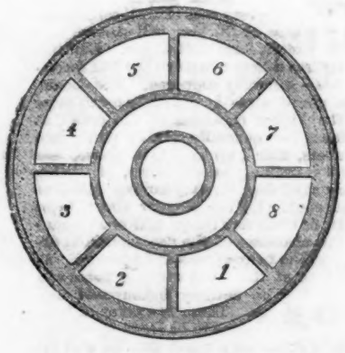

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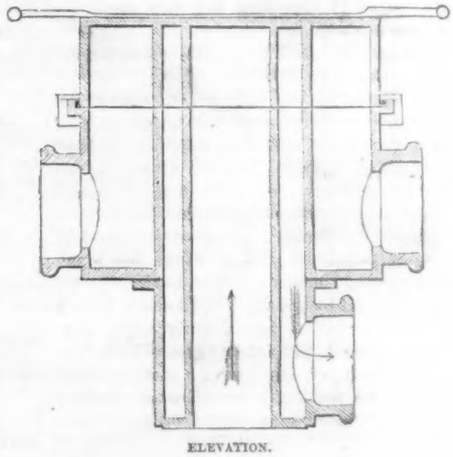

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IN.		IN.		IN.		IN.		IN.	
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CONSULTING CHEMIST, GEOLOGIST AND GENERAL SCIENTIST—
PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

MONDAY, APRIL 3, 1871.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subject to which its colums are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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General Editorials.

ENRICHMENT OF GAS—PETROLEUM AND NAPHTHA GASES.

In pursuance of this subject for enrichment, it is clearly incumbent on us to record what comes to us, regarding the applications of petroleum in this direction, which are now much occupying the attention of the American gas fraternity. Having room here, however, for but a few sentences, we can but introduce the subject at this time. Hereafter we shall give most important facts that have been developed recently, including the results of most significant experiments made by an eminent gas-engineer in this city; from which we draw the general conclusion, by some very simple ciphering, that whatever may be the success attending the employment of petroleums as gas materials *alone*, whether with the dilution of the resulting gas by air or otherwise, it will most certainly be in a high degree advantageous to use these mineral oils (*with certain precautions*, which are very simple, and very reasonable, at least to a chemical mind, when once made out) for the enrichment or "sweetening up" of poor coal gas or of water-gas. As to the use of air as a diluent for petroleum gas, as has been practiced at Saratoga, according to plans founded primarily, we believe, upon certain patents of Dr. L. D. GALE; we are informed that these same plans are now in use at Memphis, Tenn., and our correspondence with gentlemen whose standing gives their opinion the highest authority, represents the results there attained in so favorable a light that we shall endeavor at once to obtain the facts, in reliable form, for the public benefit; the more especially as we have ourselves been heretofore in the habit of regarding the very rapid depreciation (amounting apparently to a large dead loss of light) in the dilution of illuminating gases with air, as a very strenuous objection against plans of this sort. As it is, however, and is to be, our principle, to let no preconceived view or bias, stand in the way of strict investigation, we hope soon to arrive at the truth of this question, with that of many others. We may, in conclusion of this brief note, throw out one remark to illustrate our present position that the general subject of the use of petroleum in Gas Works has much more interest and importance than has been usually acceded to it by gas experts hitherto. This is that, although it has been hastily assumed or taken for granted, without any special investigation, that gas made from such a material must necessarily be lacking in permanency, (and be condensable indeed to a degree not only inconvenient, but fatal to its utility); recent experiments made and reiterated, with undoubted accuracy, have proved that, while a New York gas lost by exposure to a cold of six degrees below zero, Fah., some thirty-five per cent. of its candle power, a gas made from petroleum which was rated at over fifty-candle power (undiluted) lost when subjected to the same depleting operation, but twelve per cent.

Thus far, we had written, and in fact put in type, for last issue, but it was crowded out; and we have in the mean time received, as anticipated, words of weight indeed, on this subject; being no less than a series of most valuable communications from a gentleman distinguished both as a Gas Engineer and Gas Chemist, which include *Chemical Analyses* of the gases produced by these new methods of operation. It appears that Mr. EDGERTON'S* examinations of the practical workings at Memphis led him to initiate this series of analytical examinations, on samples collected by himself on the spot, the results of which were so conclusive that, with a degree of decision which is clearly characteristic (and which the "conservatives" will call "rash," but which we are fully persuaded, will be found to be but an altogether commendable energy and promptness, in following the bent of convictions founded on strict scientific data), he recommended its immediate adoption in the Fort Wayne Gas Works under his charge. Since then Mr. EDGERTON has still continued his elaborate chemical analyses, and from the mass of results he has sent us we shall hereafter select a number which throw much light on the constitution and character of the gases from petroleum. In the present issue we find but room, and that by displacement of other matter, of only less importance, to commence the publication of a report by him to his company, which will serve to introduce his analyses hereafter.

We venture to think that the presentation here also of part of a letter from the present writer to Mr. EDGERTON, under date of December 29, 1870 (while showing in how far our own studies had been hereunto directed), may not be useless in making the results of this gentleman somewhat clearer.

"Our Amertcan petroleums are chiefly composed of what are called by chemists hydro-carbons of the marsh-gas series. The chemical formulæ of these, in complete series, commencing with marsh-gas (the hydrocarbon of all those known, containing the most hydrogen), are:

(1.) C^2H^4; (*Marsh Gas.*)
(2.) C^3H^6; $= C^2H^4 + C^2H^2$
(3.) C^6H^8; $= C^2H^4 + C^4H^4$ (*Olefiant?*)
(4) C^8H^{10};
(5.) $C^{10}H^{12}$; up to *Paraffine*, which may be as high as $C^{30}H^{62}$ (BERTHELOT.)

"When any of this hydrocarbons are exposed to incandescence, decomposition always takes place, with production of more or less marsh gas, and of course there is left a surplus in every case of both carbon and hydrogen. In the case of (3) you will observe that this surplus might exactly form olefiant gas. Olefiant, however, is of far less common occurrence and formation than has been generally supposed. The decomposition in the above cases is generally much more complex, and the higher members of the series, as found in petroleum, are generally split up partly into the lower members, which, up to (4), as above, are *permanent gases* at ordinary temperatures, (4.) being condensable only at 32 deg. F., (5.) boiling as low as 86 deg. F., and soon, (4.) has a vapor about twice the weight of air, or some five times that of an ordinary coal-gas. The character of the decomposition depends greatly upon the temperature and pressure. At the higher heats, as at the usual working heats of a clay retort, much may be entirely decomposed into carbon and free hydrogen. There is a point of temperature, however, which seems to be about low cherry red, at which little or no carbon is deposited, and yet a large portion of the vapors are converted into marsh gas and hydrogen, which will retain in solution (and prevent the condensation of) the remaining undecomposed, or partly decomposed, vapors, at quite low temperatures, for longer or shorter times. * * * * *

The above may be regarded as a (probably advanced, though but partial) view of petroleum gas, from the chemical stand-point of our knowledge of the elements involved, *prior* to Mr. EDGERTON'S valuable analyses. His results, as could scarce fail to occur, modify these views in some essential respects. Especially does he find that, with proper management of the heat, the splitting of the molecules so far as to develop *free hydrogen*, may be almost entirely avoided.—H. W.

* Not the least of Mr. EDGERTON'S claims to the scientific rank we accord him, consists in his title, conclusively established (through the testimony of Mr. SMEDBERG, published in these columns in the form of a letter to Mr. FARMER. See issue of May 16, 1870, page 148) to the *first discovery* of the *Rule of Squares* in Photometry, which was first published, however, by Mr. FARMER (through Prof. SILLIMAN), as an independent discovery. With regard to this subject, it appears to us proper to produce here (though in so doing we take a liberty, without consulting Mr. EDGERTON) an extract from one of his letters of date March 19th:

"I may also announce to you with confidence that I have discovered substantially a chemical corroboration or proof of the 'Rule of Squares,' which rule I see questioned by leading experimentalists. I own to feeling annoyed at finding not only the public (*vide Phil. Ledger*) but gas men also, giving the credit of the discovery of this rule entirely to Mr. FARMER, I do not want to detract from Mr. FARMER'S credit. Mr. SMEDBERG unfortunately did not answer my letters on the matter, or I should have been able to present the Rule of Squares as I had proved it in January 1868. In fact, in 1867 I was experimenting with a view to substantiating it.

"HENRY EDGERTON."

GOV. HOFFMAN'S VETO OF THE GAS BILL.

The bill passed by the New York Legislature, to amend certain Acts relating to the inspection of Gas Meters, received Governor Hoffman's veto on the 22d March. and failed to pass over the Governor's objections.

The subjoined extracts from the veto sufficiently explain the character of the measure, and appear amply to warrant the Governor's action:

The first section of the bill returned amends section 1 of chapter 311 of the laws of 1859, by providing that for every stamp or seal put upon a gas meter by an inspector the inspector shall receive five cents, to be paid by the manufacturer of the meter. This is in addition to the salary now payable in the first instance out of the State treasury, but which is ultimately charged and assessed by the State upon the different gas companies.

The right of the Legislature to provide for the inspection of gas meters (which are "measures"), and to charge the expenses upon the companies who sell the gas by these measures, under the constitutional provision relating to weights and measures, will not, I suppose, be denied; but to impose a tax or charge upon the manufacturer of the meter, to be paid to the inspector, is, I respectfully submit, clearly in violation of that portion of section 8, of article 5 of the constitution of the State, which abolishes "all offices for the weighing, gauging, measuring or inspecting any merchandise, produce, manufacture or commodity whatever."

The meter can properly be inspected at the expense of the individual or corporation using it as a measure for the sale of gas, but not at the expense of the manufacturer, who holds it merely as a mechanical production—an article of manufacture. In this opinion, I respectfully submit, the Attorney General of the State concurs.

There is another objection to this bill, which being stated will also, I am confident, command the assent of the Legislature. It is this;—The Inspector of Gas Meters is an officer of the State, appointed by the Governor by and with the consent of the Senate. By chapter 116 of the laws of 1860 his salary was increased from $1,500 to $2,500 per annum and he was authorized to appoint deputy inspectors, to reside in different parts of the State where gas meters were manufactured, who were to receive two dollars a day from him out of his salary, when actually engaged in the discharge of their duties.

There can be no doubt, I think, that this provision was not only wise, but sufficient for the accomplishment of the end in view. The Inspector would appoint only when necessary, the Chief Inspector being obliged to pay them out of his increased salary a *per diem* allowance.

The bill now returned makes an entire change in this respect. It authorizes and requires the Inspector to appoint three deputies, and no more—one for New York, one for Brooklyn and one for Albany, each of whom shall receive a salary of $2,500, to be paid primarily out of the State Treasury (ultimately to be assessed upon and apportioned among the gas companies). If these deputies are needed in New York and Brooklyn and Albany it is difficult to see why they will not be required also for the other cities of the State. Morecver, if the public interests demand these appointments under salary, which is greatly to be doubted, I respectfully submit that as matter of public policy, they should be appointed as the Chief Inspector himself is appointed, namely, by the Governor and Senate. It seems to me impolitic, if not improper, to confer upon the Inspector, who is an appointee of the Governor and Senate, the power to appoint three deputies, each of whom possesses as much power as he does, and who, together, draw from the Treasury of the State nearly twice the amount of the salary.

I therefore respectfully submit that this bill should not become law.

ELECTRO MOTIVE FORCE.

We have never neglected to call public attention, briefly at least, to discoveries in all departments of Science, and we now notice one of no ordinary interest. The possibility of applying electro-magnetism as a motive power, in a simple and inexpensive manner, is not only being now theoretically discussed but also practicall tried with great promise of success. If the results be favorable, it is almost impossible to over-estimate their importance.

Looking at the battery as the source of power, it has been taught by scientis that a given consumption of zinc (or a a given amount of chemical change) can only produce a certain maximum of force, but the truth is now said to be, that although the electro-motive force may be in the battery, yet that the magnetic power which follows its application is capable of indefinite enlargement, without increase of the initiative agent.

Our cotemporary (*Journal of the Telegraph*) lately observed—"the magnetic power is not proportional to the size or consumption of the elements of a battery, although dependent upon it as an initial force."

It seems to us that recent experiments have shown the magnetic power, from a given consumption of zinc, to be far greater, or certainly that very much more if it can be readily utilized, than was previously supposed or known. Our readers will find very interesting papers, by the Rev. H. Highton, on this subject (reprinted from the "*London Chemical News*"), in late issues of the "*Journal of the Telegraph.*" In the first February number is a description of the practical application by Mr. H. M. Payne of Newark, N. J., of principles apparantly similar to those advocated by Mr. Highton, briefly stated above, but the results of independent investigations and experiments conducted by Mr. Payne.

NEW ORDERS TO THE DEPARTMENT OF PUBLIC WORKS.

Mr. Tweed has, it is announced, introduced a bill, in the New York State Legislature, authorizing the Department of Public Works to furnish gas to the citizen's of New York.

We do not exactly comprehend this, and shall be glad of more light on the proposition.

New Publications.

THE SCIENTIFIC MANUAL.—We have received a copy of this new enterprise in journalism, to be published monthly, in Cincinnati, by Messrs. Zerbe, Perine & Co., of the Great Western Patcnt Agency. It is a neat sixteen page illustrated paper, devoted to Art, Mechanics, Manufactures, Inventions and Patents, and has a promising appearancer Terms, $1 per annum.

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Answers to Correspondents.

A. F. J. of Md.—Procure a gas thermometer, and you will have a certain check on such irregularities. A glance will reveal the true state of the case, and enable you to regulate your condensing apparatus, so as to avoid such trouble in future. Guess work will not do in so important a branch of manufacture as that of gas, which should be managed with the greatest exactness.

T. H. L. of Boston.—Your communication on Peat was not received in time for publication in this issue but will appear in our next.

E. M. of Pa.—Clegg was the inventor of the first self-acting apparatus for the measurement of gas. The principle of the Archimedean screw was first applied to gas meters by Mr. John Malam.

D. P. A. of Conn.—In 1852 there were in London 18 gas works, employing a capital of $14,000,000, and producing a yearly revenue of $2,250,000. Since that time there has been a large increase, but we have not now the data at hand to state the actual expansion of the gas business in London.

L. J. of O.—We do not see how the ascension pipes can become clogged, if care is taken to clean them every time the retorts are opened. There must have been some inattention on the part of the stokers.

S. T. of Easton, Pa.—If you draw your water off to a level with the journal, and put in a pint of common lubricating oil, then fill with water it will remove the trouble. Another method is to fill the meter with benzine, which will remove all incrustation and keep it clean; or if, as you think, the trouble arises from the water, we would advise you to boil it and skim it of its impurities, and it will be soft.

F. C. of New Orleans.—If the leakage occurs at the joints of the gasometer, take one part red lead in oil, one part white lead in oil, and one part litharge intimately mixed and pushed into the crevices with a spatula; but if otherwise give it a coat or two of metallic paint; or boil some tar witu a little resin and apply until it has the effect.

C. J. F. of Mass.—The value of Boghead cannel coal as a gas coal is variously estimated by different authorities, some placing the number of cubic feet of gas per ton at 11,000, while others make it above 16,000.

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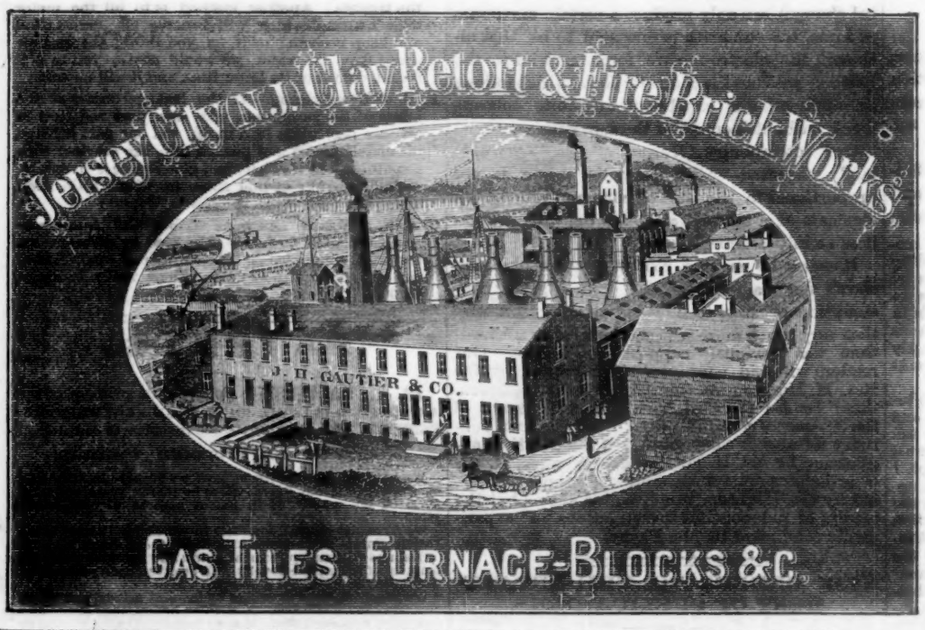

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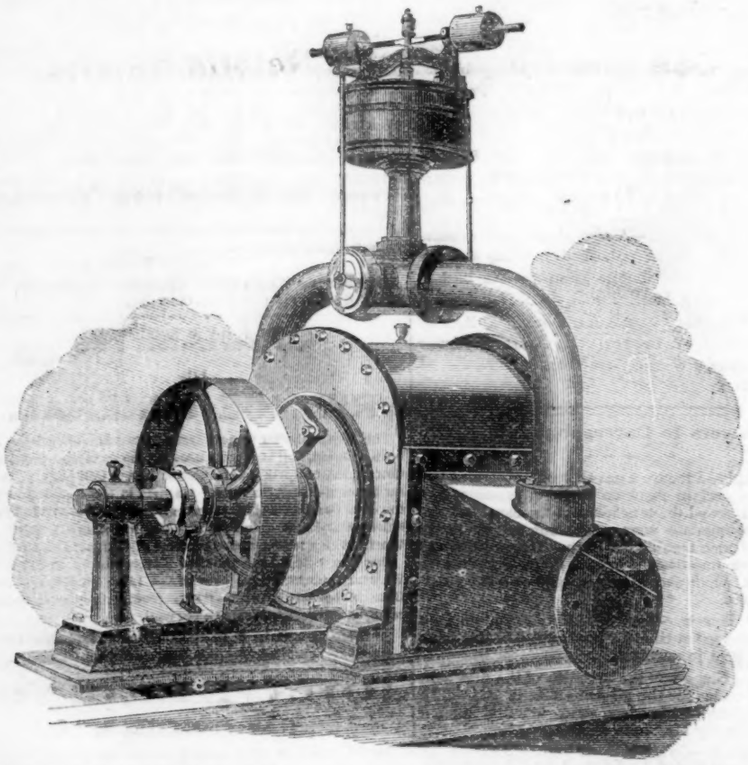

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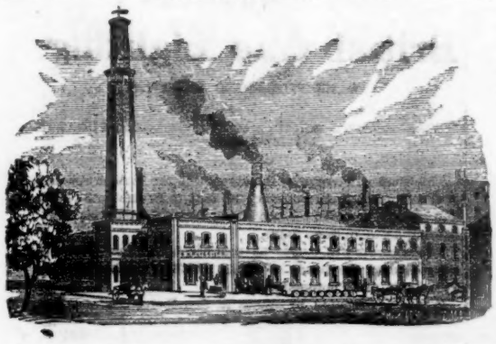

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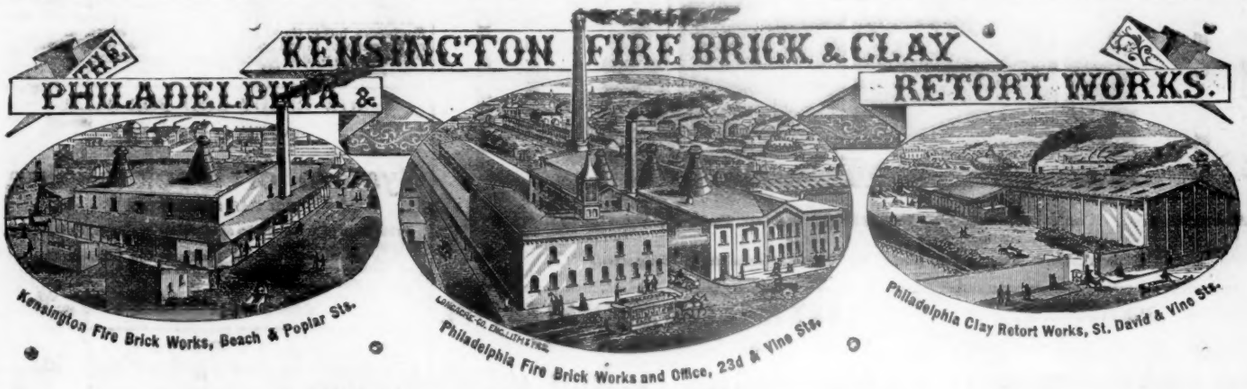
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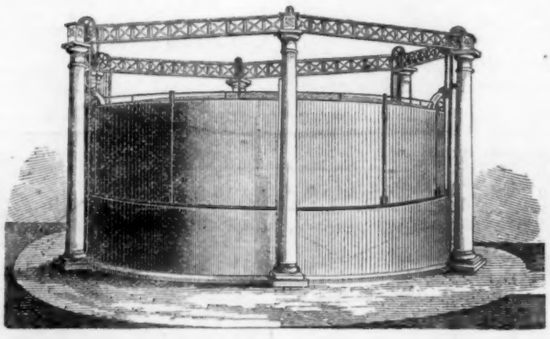

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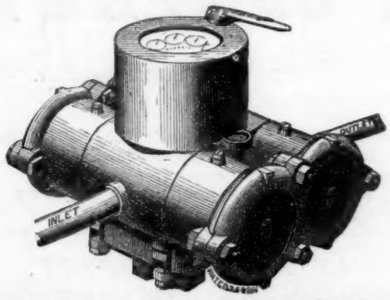

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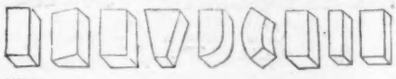

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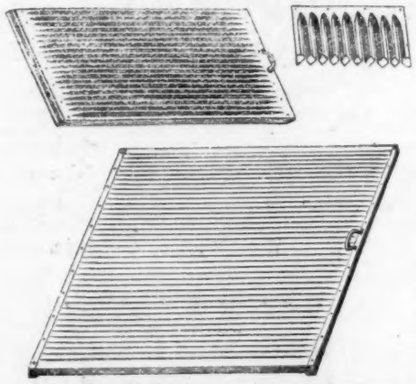

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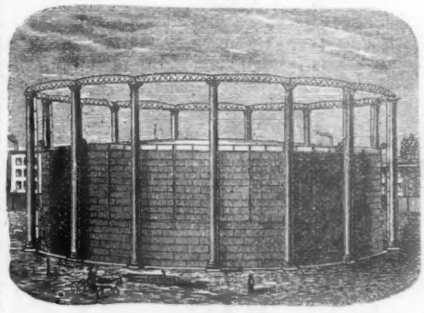

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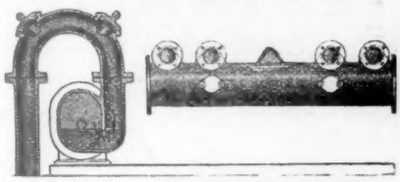

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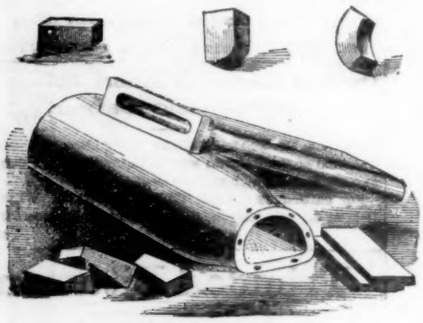

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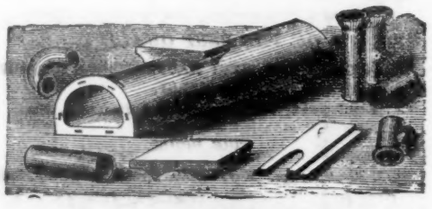

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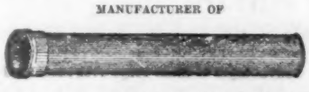

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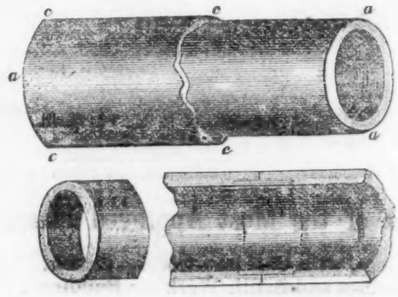

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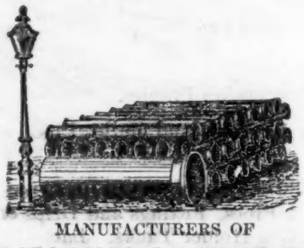

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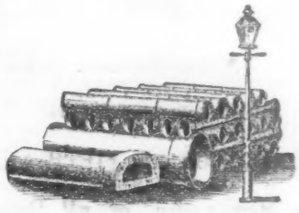

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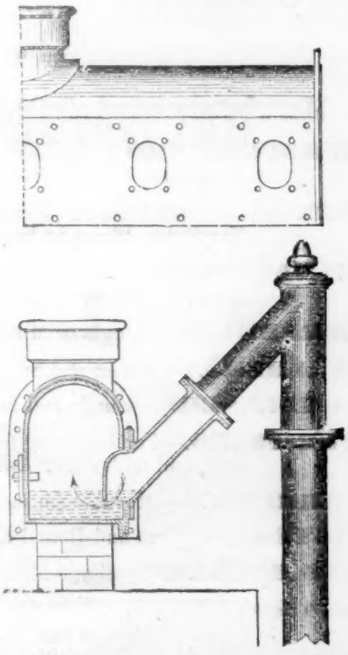

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